
List of U.S. Army Research Institute Research and Technical Publications

October 1, 1996, to September 30, 1997

With Author and Subject Index



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United States Army Research Institute for the Behavioral and Social Sciences

1998

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U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Directorate of the U.S. Total Army Personnel Command

EDGAR M. JOHNSON
Director

NOTICES

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Foreword

The means of dissemination of the results of ARI's research and development/studies and analysis program vary widely depending on the type of work, the subject matter, and the sponsor/proponent. Typically, major findings with immediate policy and procedural implications are briefed to sponsors and proponents in order to enable timely implementation. This is followed up with complete documentation in the form of research and technical publications such as the ones listed here. In many cases, these documents represent the actual item handed off to the sponsor/proponent; this is particularly true of the Research Product category. In other cases, results are published in order to provide a complete record of the work done, and for future reference by researchers doing work in the same or similar areas.

This annotated list for FY97 provides an idea of both the depth and scope of the ARI research effort, and is a valuable resource for anyone interested in military psychology from either a scientific or operational perspective.

ZITA M. SIMUTIS
Technical Director

EDGAR M. JOHNSON
Director

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Introduction

The primary responsibility of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) is to maximize soldier effectiveness. ARI accomplishes its mission through research and development in the acquisition, training, utilization, and retention of Army personnel. ARI research and products affect every Army mission with a human performance component.

As convenient references for qualified agencies and individuals and sponsors, ARI publishes lists of its technical and research publications. This issue of the publication list describes reports published during the period October 1, 1996, to September 30, 1997. It contains the abstract of each publication and the bibliographic information needed to identify a publication. The abstracts have been written, as far as possible, to describe the principal research findings in nontechnical terms; however, technical language is used to communicate efficiently the details of research analysis. Author and subject indexing provides access to individual reports and topics.

This publication supplements the 44-year list of ARI publications issued from October 1, 1940, to September 30, 1983; the list of publication abstracts issued annually from October 1, 1958, to September 30, 1983; and the list of publications issued from October 1, 1980, to September 30, 1986; January 1, 1986, to September 30, 1989; October 1, 1989, to September 30, 1994; October 1, 1995, to September 30, 1996.

ARI Publications

ARI publications are divided into separate, consecutively numbered categories appropriate to their intended audience and function. During fiscal year 1996, the following types of research and technical reports were issued by ARI:

Research Note (RN). An interim or final report typically of limited interest outside of ARI. It is filed with the Defense Technical Information Center (DTIC) but is not printed. Research Notes usually fall into one of the following categories:

- An inhouse report that is of limited interest outside of ARI but is considered worth submitting to DTIC to be part of the Department of Defense (DoD) archive of technical documentation.
- An interim contract report that is of limited interest outside of ARI but is considered worth submitting to DTIC to be part of the DoD archive of technical documentation.
- A final contract report that is of limited interest outside of ARI but must be submitted to DTIC in accordance with Department of the Army regulations to close a contract.
- Material related to a Research Report or Technical Report (detailed tables, graphs, charts, sample forms, and sample training and testing materials) published as a Research Note to economize on printing and distribution.

Research Product (RP). A user-oriented report intended to aid Army personnel. Examples are handbooks, manuals, and guidebooks.

Research Report (RR). A report of completed research intended primarily for dissemination to military managers. Research Reports may deal with policy-related issues but typically do not include specific policy recommendations.

Special Report (S). A published report on a topic of special interest or in-house research intended primarily for dissemination to a select audience.

Study Report (SR). A published report briefly documenting studies and analyses.

Study Note (SN). A Study Note may contain or consist of technical text, computer code, diskettes or tapes with software, databases, codebooks or other documentation, raw data, data collection instruments, figures, tables, or any other products that do not concisely convey the import of a project but which must be archived for technical completeness.

Technical Report (TR). A report of completed research intended primarily for dissemination to researchers.

Research Reports and Technical Reports published by the U.S. Army Research Institute for the Behavioral and Social Sciences are intended for sponsors of research and development (R&D) tasks and for other research and military agencies. Any findings ready for implementation at the time of publication are presented in the last part of the Executive Summary. Upon completion of a major

phase of the task, formal recommendations for official action normally are conveyed to appropriate military agencies by briefing or memorandum.

ARI Distribution

Initial distribution of these publications was made directly by ARI. Research Reports, Technical Reports, Study Reports, and Research Products were distributed primarily to operational and research facilities and their sponsors in DoD, to other interested Government agencies, and to DTIC; copies of some reports were also sent to the Library of Congress for distribution to libraries participating in the Documents Expediting Project. Research Notes and Study Notes were deposited with DTIC but were not published.

These publications are **NOT** available from ARI. DoD agencies and contractors can purchase paper copies or microfiche from—

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5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650

NOTE: When requesting copies of these reports, use the DTIC accession number (AD _____) appearing in parentheses following the date of publication of each citation.

Research Notes

RN97-01 VIEW: Visualization and Interactive Elicitation Workstation—A Tool for Representing the Commander's Mental Model of the Battlefield, Zacharias, G.; Illgen, C.; Asdigha, M.A., Yara, J. December 1996.
(AD A322 458)

This research assessed development of a Visualization and Interactive Elicitation Workstation (VIEW) for inferring and representing mental models of the battlefield. The prototype is composed of two subsystems: a Visualization subsystem and a Knowledge Elicitation (KE) subsystem. The Visualization subsystem is composed of three interlinked modules: (1) a Tactical Visualization Interface providing linked displays for visualizing the battlefield; (2) an Object Database providing a common object representation for environmental and military entities; and (3) an Object World Model providing behaviors for objects in the database. The KE subsystem is composed of two linked modules: (1) the KE interface, which navigates across direct, indirect, and observational techniques, collection of elicited data, and KE analysis results; and (2) the KE Recording/Analysis Module, which records the elicited data. A demonstration illustrates coupling between the visualization and elicitation components and support of direct and indirect mental model examination. Direct techniques use a case-based interview format; indirect techniques include repertory grid analysis, multidimensional scaling, and hierarchical cluster analysis.

RN 97-02 Canceled.

RN97-03 A Note on Organizational Leadership as Problem Solving, Tremble, T.R. Jr.; Kane, T.; Stewart, S.R. January 1997.
(AD A328 330)

Approximately 780 officers in the chains of command of 53 U.S. Army battalions responded to paper-and-pencil exercises in order to test the replicability of earlier results on a model which links effective leadership to problem-solving abilities.

In this replication, criteria included subordinate and superior assessments of leadership behavior/performance as well as career achievement (rank and awards). Limited replication of the earlier results was obtained. The group of variables reported earlier to predict achievement were also significantly associated with achievement in this replication. However, strengths of relationship were appreciably less than reported earlier for achievement and weak (even though statistically significant) for superior and subordinate assessments. The obtained data also raised questions about the validity of measures newly designed for the earlier effort and about the reliability of measurement needed for leader development research and practice.

RN97-04 Appendices. Service Tactical Training with Distributed Interactive Simulation Technology, Bell, H.H.; Dwyer, D.J.; Meliza, L.L.; Love, J.F.; Mirabella, A.; Moses, F.L. February 1997.
(AD A336 275)

These appendices support a report, bound separately, which recommends practices for planning and conducting tactical training using Distributed Interactive Simulation (DIS) technology with multi-Service groups. Groups are geographically separated. The recommendations presented are based on the experience gained from the Multi-Service Distributed Training Testbed (MDT2)—a testbed designed to develop training opportunities and tools to increase the utility of multi-Service training. MDT2 is a realistic, although synthetic, environment for training with the flexibility to support planning, preparation, execution, and feedback for the multi-Service Close Air Support (CAS) mission. This report combines the knowledge from MDT2-CAS with the authors' knowledge of training into recommendations about how to train best with DIS technology.

RN97-05 The Utility of the Training and Evaluation Outline Data Base as a Performance Measurement System at the Joint Readiness Training Center, Fober, G.W.
March 1997. (AD A328 136)

The purpose of this research was to examine the Training and Evaluation Outline (T&EO) data base for utility as a performance measurement system. Previous research had determined that the data base was of limited value for making empirical analyses of the Joint Readiness Training Center (JRTC) performance data. Based on recommendations from the previous findings, JRTC changed the performance measurement system. The changes included the introduction of a five-point rating scale and a reduction in the number of rated items. The current research was conducted to determine whether these additions increased the utility of the T&EO data base as a feedback and performance measurement system. T&EO data were analyzed at battalion task force, company, and platoon levels for nine rotations at the JRTC. It was found that the T&EO data base still lacks the reliability required to provide useful feedback to units or to provide researchers with useful information on unit trends. Although tasks differed statistically, the usefulness from a practical standpoint is limited because the range of scores is too narrow. Potential users of the data base are cautioned not to make conclusions based solely on statistical significance. Recommendations to improve the data include reducing the rating categories to more general levels and placing a greater emphasis on the importance of a quality performance measurement system. A method to reduce the number of rating categories using subject matter experts was introduced as one way to improve the performance measurement system.

RN97-06 Environment for Multi-Media Interactive Instruction (EMMii) Users Manual,
André, C.R.; Salter, M.S. March 1997.
(AD A328 141)

This report documents the Environment for Multi-Media Interactive Instruction (EMMii), the training management system used in the Battalion and Brigade Battle Staff Training System (BSTS). BSTS, a set of functional area training packages for battalion-

and brigade-level staff officers, is a combination of text and computer-based instruction (CBI). Sponsored by the Advanced Research Projects Agency (ARPA), the BSTS was developed for use by the U.S. Army National Guard (ARNG). These prototype BSTS comprised 13 courses for training staff officers in individual functional areas and those tasks required to prepare staffs for collective battle staff tasks. This report is for archival purposes only; the EMMii is not available as a stand-alone product.

RN97-07 Education Credential Tier Evaluation,
Laurence, J.H.; Ramsberger, P.F.;
Arabian, J.M. May 1997. (AD A335 804)

This report summarizes the education credential tier system used to reduce the likelihood of first-term attrition among enlisted personnel. In addition, the reliability of coding credentials within their assigned tiers as well as the appropriateness of credential categorization is assessed. Finally, multivariate analyses of sociodemographic characteristics related to attrition are presented to demonstrate the confluence of personal factors associated with attrition.

RN97-08 Visualization and Judgmental Forecasting of Simulated Battles, Sollick,
R.E.; Spiegel, D.K.; Lussier, J.W.; Keele,
S.D. May 1997. (AD A328 489)

Army officers were given information about battles fought in training exercises. They were required to report upon the current situation and to predict future locations and strengths of the forces involved. A battery of cognitive tests was also administered. Accuracy of judgment was associated with experience and with some of the cognitive abilities tested, particularly with memory for spatial relationships, at which the officers excelled. However, the influence of experience was dependent upon the inherent predictability of the scenario. Experienced officers did better on a normal mission plan but were less accurate on a plan that was poorly executed. The overall pattern of results suggested that accuracy is strongly influenced by the pace of battle. Static or slowly changing conditions were relatively easy to visualize and predict, but rapidly changing conditions were associated with large increases in error.

RN97-09 Evaluating the Effectiveness of CAS3 from the Perspectives of the Students,
Fuegen, K.A.. May 1997. (AD A328 508)

The Combined Arms and Services Staff School (CAS3) is a 6-week course for Army Captains that teaches the skills necessary to function as effective staff officers. The U.S. Army Research Institute for the Behavioral and Social Sciences helped in the evaluation of CAS3 by collecting feedback from students regarding their experiences in the course. One week before graduation, CAS3 students completed a survey that assessed improvement on a variety of skills and asked for the students' perceptions of the course. This report is based on the students' most and least valuable experiences at CAS3 as well as their recommendations for change. Although interacting with other branches was viewed as one of the most valuable experiences at CAS3, students listed poor group dynamics as one of their least valued experiences at CAS3. The results are discussed in terms of recent changes at CAS3 and the importance of the combined arms concept.

RN97-10 Formatting Battlefield Function. Function Analysis for Automated Systems Approach to Training, McIlroy, B.J.; Mullen, W.J. III. March 1997. (AD A336 090)

The Armored Forces Research Unit, U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), in coordination with the U.S. Army Force XXI Training Program (FXXITP), has sponsored research on the utility of battlefield functions (BFs) for training the armored brigade. This research is a continuation of previous work performed to analyze and use BFs applicable to the heavy battalion task force to support a Functional Approach to Training strategy. This report provides the history and lessons learned for the effort to analyze seven BFs applicable to the armored brigade, as well as describes the methodology and procedures used to develop function analyses (FAs) for the selected brigade BFs. The methodology and processes used for the development of BF FAs are described and provide the basis for future development of BF FAs for other type units and echelons.

RN97-11 Feedback for Skill Acquisition: Preliminaries to a Theory of Feedback, Schmidt, R.A. May 1997. (AD A328 695)

In training for skills, feedback about skill proficiency—termed knowledge of results (KR) in the laboratory—is critical to efficient learning. But, while various manipulations of KR in acquisitions can provide immediate benefits for performance, these may disappear in retention tests. In several paradigms, we show that (compared to feedback after each trial) making feedback less “useful” by giving it less frequently, or by summarizing or averaging it after several trials, degrades performance in acquisition, but produces superior learning as measured on retention or transfer tests. Preliminaries to a guidance theory are proposed on retention or transfer tests and are proposed to account for these effects. In this view, frequent feedback has various negative effects that degrade retention, such as (a) the encouragement of maladaptive short-term corrections that disrupt response stability, and (b) the blockage of information-processing activities that lead to the learning of error-detection capabilities. Practical implications of these concepts for Army training procedures are discussed.

RN97-12 Team Training and Performance Research: A Ten-Year Review, Browers, C.A.; Weaver, J.L.; Urban, J.M.; Morgan, B.B. Jr. May 1997. (AD A335 775)

The military has become dependent upon the performance of teams for many critical tasks. Consequently, there is a clear need to understand the nature of team performance to develop training interventions for use in ensuring effective military teams. Unfortunately, the scientific literature regarding team performance has provided little guidance regarding the nature of team performance or the most efficacious paradigms for team training. Since Dyer's review (1984) 10 years ago, interest in team training and performance has greatly increased. The current effort discusses issues raised by Dyer in light of the past 10 years of research and remaining research needs in these critical areas.

RN97-13 The Development of Patterns of Commitment: Implications for Performance, Becker, T.E.; Billings, R.S. May 1997. (AD A328 692)

This report provides the results of four studies of the relationship among certain dispositional variables, cognitive factors, employee commitment, intentions, and performance. Study 1 developed measures of attachment styles, Study 2 examined the relationships between personality factors (including attachment styles) and job attitudes, Study 3 demonstrated that attachment styles and motivation to commit predict organizational commitment, and Study 4 established that certain forms of commitment predict employee performance. Conclusions and recommendations are presented for each study.

RN97-14 Skilled Use of Computer Software: Implications for Training and Design, Olson, J.; Polson, P. June 1997. (AD A328 492)

This research had two goals: to work toward developing a comprehensive cognitive theory of human-computer interaction, both learning and performance, and to develop methods for designers to apply this knowledge to the design of new software and its training. The researchers compare the actual moment-by-moment activity of users of software with predictions from a model, leading to extensions of the model and additional rounds of empirical testing. At the end of the project, more was understood about the development of expertise in people who use software, focusing in particular on how people build on what they know already when they encounter a new application. In the second methodology, designers follow concrete, well-specified steps that guide them through a set of analyses—first of the users' tasks, and then highlighting aspects of the target system that the model tells us may prove difficult for the user to learn or perform. The researchers conclude with an attempt to develop methods for designers to help them assess how long it will take to learn the software, based both on the complexity of the software and how much the learner already knows.

RN97-15 The Analysis of Equivalence Classes, Fields, L. June 1997. (AD A336 076)

Many essential skills required of military personnel involve responding in the same manner to cues that are perceptually different. One example of such a set of cues would be the representations of an airplane produced by visual sighting, radar, infrared detection, and IFF, or acoustic signature. Another example would be the topographical map representation, the visual image, and the orienteering symbol for a given terrain feature, such as a mountain. Perceptually different cues that have become interchangeable are said to form an equivalence class. Recognizing the interchangeability of the representations in the airplane set is critical if one is to react appropriately to an airplane in battlefield conditions; recognizing the interchangeability of the representations in the terrain set is critical if one is to navigate appropriately from a map. In addition, because the cues experienced in training will resemble but will not be identical to the cues encountered in the field, it is also critical for individuals to generalize from the cues in training to the cues in the field.

RN97-16 Enhanced Virtual Presence for Immersive Visualization of Complex Situations for Mission Rehearsal, Cutt, P. June 1997. (AD A336 568)

This final report describes the key requirements of an internet-based system that provides an immersive environment for mission rehearsal. It shows how off-the-shelf hardware and software can be used to meet those requirements. A layering implementation technique is used with the common hardware and software to provide economies of scale both in the use of new hardware/software and functionality. Finally, specific hardware/software is described where necessary to provide support for mission rehearsal. In particular, new inventions such as the Internet Appliance and Remote Access Controller are described in detail together with their implementation.

RN97-17 Rapid Capturing of Battlefield Mental Models, Cohen, M.S.; Thompson, L.A.; Bresnick, T.A.; Tolcott, M.A.; Freeman, J.T. July 1997. (AD A336 079)

The present report pursues theoretical, empirical, and practical issues in the design of a real-time mental model capturing system. We describe a framework for situation understanding that includes several qualitatively different types of mental models (pattern-matching, interpretative, and generative), and a set of metacognitive processes that monitor mental models for problems of uncertainty and adopt corrective strategies when problems are found. Based on coding and analysis of interview and problem-solving data, a set of five key mental model structures was identified that officers consistently use to organize their understanding of battlefield situations. Based on further analysis of the same data, we found features of the environment, the context, and the individual officer that predict the type of mental model that is used. Finally, we drew on these results to develop a proof-of-concept mental model capturing system. The system provides users with flexible tools for creating graphical structures to represent both their knowledge and uncertainty regarding a situation. The system dynamically adjusts its advice based on the environment, user, and immediate context. This system has potential use as a decision support tool, as a team aid, in evaluation and training, and as a research tool.

RN97-18 Optimizing the Long-Term Retention of Skills: Structural and Analytic Approaches to Skill Maintenance, Healy, A.F. August 1997. (AD A336 077)

Progress has been made on the topics of tank gunner skills, Morse code reception, color naming, instrument panel scanning, tests of the procedural rein-statement framework, mental calculation, memory for instances of categories, target detection, data entry, aspects of memory for lists, aspects of memory for course schedules, and vocabulary retention.

RN97-19 Leadership Experience and Organizational Performance, Fiedler, F.E. August 1997. (AD A335 798)

This report summarizes the major findings of a 20-year program of research on the role of cognitive resources in organizational performance. By cognitive resources we mean principally intellectual abilities, job-relevant technical knowledge, and experience. This particular report focuses primarily on the role and function of leadership experience.

RN97-20 A Cognitive Architecture for Solving Ill-Structured Problems: Final Report, Holyoak, K.J.; Thagard, P. August 1997. (AD A336 505)

A computational theory of analogical mapping is described, based on a set of constraints. The theory is embodied in a computer simulation that is applied to several examples, including psychological data on the mapping process.

RN97-21 Problem Solving of Mid-Career Army Officers: Identification of General and Specific Strategies, Pounds, J.; Fallesen, J.J. August 1997. (AD A335 891)

The Army needs a better understanding of how skilled military leaders solve problems in complex battlefield situations. The military has relied on analytic comparison methods and "6-step" models. Recent studies found that these methods do not correspond to complexities of actual tactical situations. Shortcomings of rigid procedures highlight the usefulness of more naturalistic approaches but research has yet to provide detail about using naturalistic strategies. Eighty U.S. Army officers were interviewed and asked to recommend courses of action for tactical scenarios. They discussed their approaches to problems and identified strategies used in their thinking. Results showed that participants used combinations of approaches within problems. Differences in how strategies were used to develop courses of action were compared. One set of strategies was identified as positive or negative indicators for four likely solutions. Results suggest that to effectively train skilled problem solving, approaches and strategies that are actually being used first have to be identified, their advantages and disadvantages

characterized, and methods for training them developed. Findings can be used to support training by identifying how thinking leads to solutions and how more and less skilled problem solvers differ in the ways they solve problems.

RN97-22 Current State of Army Aviator Selection.

Cross, K.D. August 1997. (AD A337 686)

The current version of the Army's Flight Aptitude Selection Test (FAST) is aging and its predictive validity has declined substantially since it was first implemented. An analysis of existing records was performed to (a) determine the impact of the FAST's declining predictive validity on aviator trainee eliminations and setbacks, and (b) estimate the benefits of increasing the FAST cut-score from its present value of 90. The analysis focused on the eliminations and setbacks that occurred during the period between January 1, 1989, and December 31, 1995. Detailed data are presented on (a) the annual number and costs of eliminations and setbacks, (b) the causes of eliminations and setbacks, and (c) the estimated consequences of increasing the FAST cut-score.

RN97-23 The Psychology of Work in Europe: A Review of a Profession. de Wolff, C.J.;

Shimmin, S. August 1997. (AD A336 073)

This review describes the contemporary scene of applied industrial and organizational psychology in Europe. After a historical introduction, the developments in six subject areas are reviewed: Selection, training, ergonomics, organizational psychology, quality of working life, and preservation of human resources. It is argued that there has been much differentiation and that there is a need for more integration. Psychologists perform several roles in organizations and in society. Some of the role conflicts are discussed.

RN97-24 Coordinating Information and Decisions of Hierarchical Distributed Decision Units in Crises. Rose, G.L. August 1997. (AD A336 263)

A program of research is described. The research addressed decision making by distributed decision makers using either consensus or leader structures

and confronted by both routine tasks and different kinds of information system crisis. There were three phases—a macro combining published empirical research, a simulation, and experimentation. The first phase documented that experimental research can offer very limited guidance for administrators as it only rarely investigates groups, and never organizations, in crises. The second phase exposed the challenges of combining simulations of individual (e.g., cognitive), group, organizational, environmental, and task properties as a strategy for guiding future experimental research. The third phase extended the capabilities of an organizational simulator and used it as a testbed for experiments. The simulator uses networked personal computers for all communications and records all communications and transactions between team members. Despite training in the simulator prior to experiments, participants failed to effectively exploit potential crisis response capabilities. Results suggest the importance of expanding systemic perspectives and practice with short-term redesign of available systems for people who work in distributed decision environments subject to crises. Experience with the simulator also suggested guidelines for future experiments on pseudo-organizations.

RN97-25 Examining the Effect of Communication Training and Team Composition on the Decision Making of Patriot Air Defense Teams. Adelman, L.; Christian, M.; Gaultieri, J.; Bresnick, T. August 1997. (AD A336 267)

An experiment investigating the effect of communication training and four group composition variables was performed with Patriot air defense teams for two different types of aircraft identification tasks. It was predicted that communication training would significantly enhance communication quantity and quality and, in turn, team performance for both tasks. Although the training did sometimes improve team communications processes, it did not improve team performance. The variable that had the biggest positive effect on communication quality and team performance was the number of hours a team had worked together. This effect was only found, however, for the type of task for which Patriot teams rou-

tinely train. It did not transfer to the less frequent and more cognitively stressing task where there is conflicting information about unknown aircraft, as in the U.S.S. Vincennes tragedy.

RN97-26 Causal Models in the Acquisition and Instruction of Programming Skills,

Reiser, B.J. August 1997. (AD A336 591)

This research project investigated how an interactive learning environment can support students' learning and acquisition of mental models when acquiring a target cognitive skill. In this project, we have constructed GIL, an intelligent tutoring system for LISP programming, and have used GIL to conduct pedagogical experiments on skill acquisition. We have studied two ways in which an interactive learning environment can facilitate students' acquisition of novel complex domains. The first set of studies examines how graphical representations provide a representation more congruent with students' reasoning. A second set of studies examines how explanatory feedback, generated from the system's problem solving knowledge, can facilitate students' learning. The experiments demonstrate computer-based support during learning can help students construct a more effective model for reasoning in complex domains.

RN97-27 Canceled.

RN97-28 Examining the Effects of Cognitive Consistency Between Training and Displays, Adelman, L.; Christian, M.;

Johnson, K. August 1997.
(AD A336 087)

This paper describes the third and final experiment performed on Contract MDA903-92-K-0134. This experiment tested the "display cognitive consistency hypothesis" proposed in Adelman, Bresnick, Black, Marvin, and Sak (in press). This hypothesis states that the effectiveness of a display format for decision aiding systems, like Patriot, depends on the consistency between how the system displays its reasoning process and how the person is processing the information. Results of an experiment using a simulated Army air defense task and college students found support for the hypothesis, but only at a

situation-specific, not global, level. Although unexpected, these results were consistent with other research performed on this contract, indicating the importance of situation-specific context for understanding judgment and decision processes in individual and group settings.

RN97-29 Acquisition and Transfer of High-Workload Skill, Lundy, D.H.;

Schneider, W. August 1997.
(AD A335 860)

Simultaneously practicing multiple tasks results in high-workload skills that may not be acquired by practicing the same tasks as single tasks. In three experiments, subjects watched a rapidly changing display and responded to consistently mapped targets in four tasks. Some subjects practiced one task at a time; some subjects practiced two tasks at a time as dual tasks; some subjects practiced combinations of single and dual tasks. After acquisition, all subjects performed transfer tasks that were multiple tasks not performed together during acquisition. The results showed a large decrease in performance when subjects were introduced to multiple tasks after training single tasks. Dual-task training resulted in nearly perfect transfer to novel task combinations. These results are discussed in terms of the practical implications of multiple-task compensatory activities.

RN97-30 Research on Interorganizational Decision Making Within a British

Airport, Heller, F.A.; Solomon, E. August 1997. (AD A337 477)

The research investigated the complex process of decision making over time, its effectiveness, and achievement. Participation by lower employees and high status of consultative committees are characteristics of democratic effective decision making. Other major influences are Meta Power (external influences) and turbulence (uncertainty). A key finding is the existence of four fairly recognizable phases of the decision cycle. The variables under investigation in the decision making cycle show significantly different impact in the four phases.

RN97-31 Individual Feedback Propensities and Their Effects on Motivation, Training Success, and Performance, Herold,

D.M.; Parsons, C.K.; Fedor, D.B.

September 1997. (AD A337 479)

This research project had as its goal the development, validation, and field testing of new measures of individual differences that assess people's propensities to seek, generate, or interpret performance feedback information in a particular way. Specifically, based on preliminary work, it was thought that internal and external propensities exist that make individuals more or less likely to prefer, rely on, seek, or attend to primarily internally or externally generated performance cues. These propensities, if identified and measured, would be related to skill acquisition, performance improvement, self-regulatory processes, performance maintenance, as well as a variety of affective and cognitive responses to performance settings based on the interaction of the performer's feedback predispositions and the characteristics of the feedback available. In summary, this study proposed to help one better understand the role of dispositions in explaining how different individuals go about shaping their feedback environment, processing feedback information, and responding to such information. The driving belief behind this line of research has been that individuals differ in ways that are specific to their orientation toward performance feedback situations, and that such differences, if identified and appropriately measured, would be valuable in better understanding the links between feedback and performance as well as other outcomes of interest (e.g., feedback-seeking, satisfaction, etc.).

RN97-32 Analysis of the Organization of Lexical Memory, Miller, G.A. September 1997. (AD A337 809)

The practical outcome of the project, "Analysis of the Organization of Lexical Memory," is an electronic lexical database called WordNet that can be incorporated into computer systems for processing English text. WordNet includes approximately 45,000 lexicalized concepts, providing a coverage equivalent to a handheld dictionary. The database has three components, one each for nouns, verbs,

and adjectives. The semantic relations that organize each component are different, but in general a lexicalized concept is represented by a set of synonyms that can be used to express the concept, the familiar semantic relations are represented by labeled pointers between synonyms sets. In order to create the database, programs were written to write and edit lexical files, to convert lexical files into database, to search the database, to strip inflections from search requests, and to display retrieved information for a user. Three user interfaces have been developed for WordNet. (1) The simplest is a commandline version that does not require a windowing system and can run on standard monitors. (2) A browser written for Sun View and for X-11 windows is intended for use with an on-line dictionary; by using WordNet, the dictionary can be searched conceptually as well as alphabetically. (3) A lexical filter written for X-11 windows catches unfamiliar words in a text file and suggests alternative expressions.

RN97-33 On Verification of Multiplication Facts: An Investigation Using Retrospective Protocols, Romer, S. September 1997. (AD A337 482)

Current theories of mental multiplication elicit two questions: (a) Do the same processes underlie answer production (e.g., $4 \times 7 = ?$) and answer verification (e.g., $4 \times 7 = 28$, T/F), and (b) Does any theory centered around a single strategy suffice to explain the underlying mechanisms for these tasks? This study involved addition of retrospective protocols to a verification task, in two experiments. The patterns of effects for reaction times (RT) and errors in both experiments were similar to Campbell's (1991) findings, suggesting that the addition of the protocols did not significantly alter the task. Analysis of the protocols provided evidence that retrieval of the correct answer from memory and then comparison to the answer given was the modal strategy reported in both experiments but was not reported for 100% of the trials. These findings imply that the same processes that underlie production are involved. Furthermore, the use of protocols can facilitate differentiating what strategies are involved and provide evidence that any theory of this skill assuming one strategy will likely be incomplete.

RN97-34 Effects of Stress on Judgment and Decision Making, Hammond, K.R.; Doyle, J.K. September 1997. (AD A338 724)

This monograph (Part II) is the second of a planned three-part series. Following Part I, which examines four literatures related to judgment and decision making (J/DM) under stress, Part II narrows its focus to a detailed treatment of stress within the J/DM literature. Six sections are included: (a) an introduction, bridging Parts I and II, (b) a consideration of two principal topics (rationality and performance) in the J/DM literature in relation to stress, (c) an examination of current textbooks, anthologies, and reviews, as well as books and articles in the human factors field, with regard to their treatment of stress and J/DM, (d) a description of current J/DM theories and models and their potential utility for the study of J/DM under stress, (e) an examination of methodological issues bearing on research on J/DM under stress, and (f) the outline of a new approach intended to advance theory and method. The general conclusion drawn from the examination of the aforementioned material (including an additional several hundred articles not cited) is the same as that drawn from the work in Part I, namely, research is lacking in coherent theoretical background, diffuse in content, and completely lacking in secure generalizations. If progress is to be made with regard to this topic, critically important to the military and other sections of society, a resolute, comprehensive effort will have to be made, theoretically, methodologically, and empirically. Part III (forthcoming) will consist of an attempt to meet these goals.

RN97-35 Immersive Visualization of Complex Situations for Mission Rehearsal, Kasper, P.K. September 1997. (AD A337 487)

The program objectives of this report included identification of an appropriate rehearsal scenario, as well as the requirements and specifications for necessary computer hardware and software. Key considerations in identifying the training scenario were intrinsic benefit to the Army, effectiveness of virtual environments for training, and benefit from implementation over a distributed computer system.

RN97-36 Training Efficiently in Virtual Environment: Determinants of Distance Perception of Stationary Observers Viewing Stationary Objects, Witmer, B.G.; Kline, P.B. September 1997. (AD A337 488)

The accurate perception and estimation of distance is an important element of many military tasks. It is necessary for orienting oneself on the battlefield, for making optimal use of terrain features during navigation, and for judging the distance from one point to another. It is also a component of both route and configuration knowledge and acquisition. In order to maximize transfer from Virtual Environment (VE) to the real world, it is important to develop an understanding of the capabilities and limitations of this new training medium. Toward that end, the present study sought to gain insight about the conditions affecting distance estimation of VEs. The purpose of this research is to examine factors that influence the perception of distance in VEs. Two experiments were designed to investigate the relative effects of such factors on distance estimates of a stationary observer positioned at near and medium distances from an object. Factors found to improve distance estimates in these experiments will be incorporated into the design of VEs for subsequent investigations.

RN97-37 Enhancing Effective Decision Making by Information Management Techniques, Breznitz, S.; Ben-Zur, H.; Wardi, N. September 1997. (AD A340 602)

Four experiments varying in complexity of decision tasks were conducted to study the effects of information about expected length of task on decision processes and choices. All experiments utilized a combined between and within subjects design with two initial levels of information (long vs. short expected list of items) and subsequent information change (reducing the long and increasing the short). In two experiments, a computerized process methodology provided detailed data on information search, speed, and strategy used. Individual differences were tested using a battery of personality characteristics. The results indicated that initially encouraging information enhances the quality of decision

processes, particularly during the first phase of the task. The impact of information change was less prominent, although it produced full reversals in several indices of decision performance. Personality characteristics interacted with the information manipulations. The role of cognitive resource allocation in decision tasks and several practical implications are discussed.

RN97-38 Towards the Improvement of Training in Foreign Languages, Healy, A.; Barshi, I.; Crutcher, R.; Tao, L.; Rickard, T.; Marmie, W.; Schneider, V.; Feldman, A.; Buck-Gengler, C.; Romero, S.; Sherrod, N.; Parker, J.; Bourne, L. Jr. September 1997. (AD A337 530)

Progress has been made on the topics of use of first-language strategies in second-language learning, the size and the nature of the functional units of reading, language processes in voice communication, vocabulary acquisition and retention, learning linguistic categories, automatic word processing, and long-term retention of knowledge and skills.

RN97-39 Designing an Interactive Multimedia Environment for Learning and Aiding Troubleshooting, Kolodner, J.; Recker, M. September 1997. (AD A336 143)

The need for effective troubleshooting is rapidly becoming ubiquitous in our increasingly technological society. However, troubleshooting is a complex process both to learn and perform. This report examines the prospects for designing an interactive learning environment that helps users acquire and engage in effective troubleshooting. This work is informed by

two important strands of related research. First, we draw upon research focused on the design and development of interactive learning environments. We are interested both in work focusing on theory-driven design on multimedia, and work focusing on how students learn in apprenticeship learning situations. The research summarized forms the basis for a prototype design of an interactive multimedia environment. The prototype is designed for the task domain of help-desk troubleshooting of computer systems problems for a large computer company.

RN97-40 Behavioral Determination of Accurate Verbal Communication: An Operant Behavior Analytic Approach, Parsons, H.M. September 1997. (AD A338 736)

An analysis of interpersonal communication was performed in terms of the operant paradigm's controlling variables, Skinner's taxonomy of verbal behavior, and the relationships between these. In contrast to formal syntactic and lexical analyses, these functional models emphasize why people speak as they do, rather than how and what. Deviating slightly from Skinner's terminology, the key operant variables, interacting through multiple contingencies, are effector (response), consequator (positive or negative reinforcer and aversive consequence), potentiator (deprivation and an aversive stimulation), and discriminator (discriminative stimulus). The verbal taxonomy's four major categories are mand and tact (which relate verbal to non-verbal behavior prescriptively or descriptively) and interverbal and autoclitic (in which components of verbal behavior are related to each other by recurrence or organization).

Research Products

RP97-01 Air Warrior Baseline Evaluation, Volume I Summary, Wright, R.H.; Hanson, R.R.; Couch, M.E. October 1996. (AD A320 909)

Air Warrior is a U.S. Army program that has been initiated to improve the fighting capabilities of helicopter crews in contaminated combat environments. The Air Warrior baseline simulations were conducted to identify and quantify the effects on aircrew mission and task performance of wearing the current MOPP IV protective and survival ensemble. Differences in performance and workload between the MOPP IV ensemble and normal flying gear were obtained for AH-64 crews flying night missions and performing a set of daylight maneuvers and tasks. The MOPP IV ensemble was found to cause major increases in workload and reduce performance on numerous aircrew tasks. Specific effects of the MOPP IV ensemble on aircrew discomfort, pain, and task performance were obtained through detailed debriefings.

RP97-02 Virtual Training Program Orientation Guide, Burnside, B.L.; Leppert, M.A.; Myers, W.E. October 1997. (AD A322 045)

This Orientation Guide acquaints leaders of armor, mechanized infantry, and cavalry units with the Virtual Training Program (VTP). Additionally, it provides leaders with sufficient information to enable them, in coordination with the Fort Knox VTP Observer/Controller Team, to decide on the type of simulation to use and the echelon and level of training to conduct during a training rotation at Fort Knox or other sites having VTP capabilities.

RP97-03 Recommendations for Planning and Conducting Multi-Service Tactical Training with Distributed Interactive Simulation Technology, Bell, H.H.; Dwyer, D.J.; Love, J.F.; Meliza, L.L.; Mirabela, A.; Moses, F.L. February 1997. (AD A328 480)

This report recommends practices for planning and conducting tactical training using Distributed Interactive Simulation (DIS) technology with multi-Service groups. Groups are geographically separated. The recommendations presented are based on the experience gained from the Multi-Service Distributed Training Testbed (MDT2)—a testbed designed to develop training opportunities and tools to increase the utility of multi-Service training. MDT2 is a realistic, although synthetic, environment for training with the flexibility to support planning, preparation, execution, and feedback for the multi-Service Close Air Support (CAS) mission. This report combines the knowledge from MDT2-CAS with the authors' knowledge of training into recommendations about how to train best with DIS technology.

RP97-04 Task Analysis of a Mobility and Survivability Critical Combat Function as Accomplished by a Brigade, Jarrett, P.A. December 1996. (AD A322 609)

This research product provides a detailed description and task analysis of one of the seven Critical Combat Functions (CCF) that comprise the mobility and survivability (M&S) Battlefield Operating System (BOS). This function is CCF 21, Overcome Obstacles. The task descriptions and analyses pertain to brigade combat teams and their interdependent relationships, both internally to the M&S BOS and externally with other BOSs (e.g., brigade staff, engineer battalion, military intelligence, and fire support). These analyses can be used by different functional specialists (e.g., training, combat, and force developers). They will be especially of value where organizational interrelationships need to be considered in issues concerning combined arms integration, iteration, and synchronization. For example, these analyses provide information useful to training developers concerned with improving the proficiency with which engineering activities are coordinated and then integrated into combat mission planning, preparation, and execution.

RP97-05 Orientation Guide for the Simulation-Based Multiechelon Training Program for Armor Units-Digital.

Winsch, B.J.; Garth, T.H., Lewis, J.M., Castleberry, J.D. January 1997. (AD A328 688)

New command, control, and communication technologies will affect soldier training requirements. Emerging training requirements for Army leaders include: (a) competency on a wider variety of tasks, (b) the ability to exploit the capabilities of new technologies, and (c) a clear understanding of digital tactics, techniques, and procedures. The current effort, Simulation-Based Multiechelon Training Program for Armor Units - Digital (SIMUTA-D), contributes a first step toward solving some of the key training challenges faced by Force XXI. The SIMUTA-D program features Movement to Contact, Deliberate Attack, and Defense in Sector training support packages which support execution-focused, battalion task force staff training for the digitally-equipped battlefield. This orientation guide provides the training unit with sufficient information to prepare to conduct training for the digital battlefield in a virtual (SIMulation NETworking [SIMNET]) or constructive (Janus) environment. In addition, it serves as a quick reference that briefly describes the essential duties and responsibilities of the training unit and an observer/controller team.

RP97-06 Special Forces Assessment and Selection (SFAS) Course: Similarities and Differences of Candidates Based on Phase Performance. Alderks, C.E. January 1997. (AD B221 692)

The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) and the U.S. Army John F. Kennedy Special Warfare Center and School (USAJFKSWCS) are pursuing a joint effort to better select candidates into Special Forces. All volunteers are assessed in the Special Forces Assessment and Selection (SFAS) course and only those who successfully complete the course are admitted to Special Forces training. The SFAS course is in three phases—prerequisite tests, Phase I, and Phase II. Candidates receive ratings and continue or are dropped at each of the phases. This report follows

candidates (by group) through SFAS based on their performance ratings (satisfactory, questionable, unsatisfactory) for many of the exercises in each of the phases. Examples of questions answered include “If a candidate is unsatisfactory during Phase I, how does he perform during Phase II?” or “Is a candidate who is satisfactory during Phase I also satisfactory during Phase II?” and “Are there any events that better predict satisfactory (or selected) status?” An understanding of how soldiers progress successfully through SFAS can help decision makers evaluate and fine-tune the course.

RP97-07 Methods for Training Cognitive Skills in Battlefield Situation Assessment. Freeman, J.T.; Cohen, M.S. January 1997. (AD A323 565)

Situation assessment provides the basis for decisions by battlefield commanders and their staff during both planning and operations. In previous work, we developed a framework for battlefield commanders' situation assessment from interviews with active-duty command staff and from published work in cognitive psychology. The present report describes methods for training cognitive skills in situation assessment based on that framework. Two training methods have been developed, both of which focus on metacognitive skills involved in verifying and improving assessments and plans. The first method helps officers find and assess the reliability of hidden assumptions. It includes a devils' advocate technique that forces officers to imagine that their assessment is wrong and to explain why, as well as techniques for handling potential problems that are found. The second method helps officers find and resolve conflicting evidence. It includes techniques for trying to explain the conflicting data in terms of the current assessment, evaluating the plausibility of the explanations, and generating alternative assessments. The training techniques have been experimentally tested with active-duty officers, and the results of that testing are described in a companion report. The training methods appear to have wide potential applicability in military as well as nonmilitary contexts.

RP97-08 Analysis of the Function to Coordinate, Synchronize, and Integrate Fire Support as Accomplished by a Division, Fields, H.T. Jr.; Mullen, W.J. III; Moses, F.L. February 1997. (AD A328 275)

This Research Product provides a detailed description of fire support as accomplished by a Division. It is one in a series that describes the tasks, performers, and outcomes for the combat function of Coordinate, Synchronize, and Integrate Fire Support. Assessment criteria are provided for reports in this series except for the one at Brigade level. Reports focus on fire support at the echelons of Brigade, Division, and Corps and to related functions at Corps as a Joint Task Force. This series of Research Products provides resource documents for military and civilian trainers to assist in the design and evaluation of single service and joint training. Doctrinal writers may use these descriptions as a basis for modifying current doctrine or for the formulation of future doctrine.

RP97-09 Analysis of the Function to Coordinate, Synchronize, and Integrate Fire Support as Accomplished by a Corps, Taylor, H.G.; Mullen, W.J. III, Moses, F.L. February 1997. (AD A328 271)

This Research Product provides a detailed description of fire support as accomplished by a Corps. It is one in a series that describes the tasks, performers, and outcomes for the combat function of Coordinate, Synchronize, and Integrate Fire Support. Assessment criteria are provided for reports in this series except for the one at Brigade level. Reports focus on fire support at the echelons of Brigade, Division, and Corps and to related functions at Corps as a Joint Task Force. This series of Research Products provides resource documents for military and civilian trainers to assist in the design and evaluation of single service and joint training. Doctrinal writers may use these descriptions as a basis for modifying current doctrine or for the formulation of future doctrine.

RP97-10 Analysis of the Function to Coordinate, Synchronize, and Integrate Fire Support as Accomplished by an Army Corps Acting as a Joint Task Force, Fields, H.T. Jr.; Taylor, H.G.; Moore, B.R.; Mullen, W.J. III; Moses, F.L. February 1997. (AD A328 260)

This Research Product provides a detailed description of joint fires as accomplished by an Army Corps acting as a Joint Task Force. It is one in a series that describes the tasks, performers, and outcomes for the combat function of Coordinate, Synchronize, and Integrate Fire Support. Assessment criteria are provided for reports in this series except for the one at Brigade level. Reports focus on fire support at the echelons of Brigade, Division, and Corps and to related functions at Corps as a Joint Task Force. This series of Research Products provides resource documents for military and civilian trainers to assist in the design and evaluation of single service and joint training. Doctrinal writers may use these descriptions as a basis for modifying current doctrine or for the formulation of future doctrine.

RP97-11 1995 Special Forces Assessment & Selection Database User's Guide and Codebook, Alderks, C.E. February 1997. (AD B227 627)

This report describes the development and contents of the 1995 Special Forces Assessment & Selection (SFAS) Database. The information in the database was obtained from the U.S. Army John F. Kennedy Special Warfare Center and School (USAJFKSWCS). Variables include basic demographics, Intelligence and Aptitude Scores, SFAS Outcome Scores, Prerequisite and Phase I Timed Events and Ratings, and Phase II Team Performance Events. This database is organized by individual and class. This database is useful if the user's objective is to analyze data within or across classes. It also provides the capability for longitudinal research and is designed to track students over time and across classes. When combined with the Special Forces Qualification Course (SFQC) Database, it can be used to track individuals through the Special Forces selection and training process. The database

was developed to answer questions of immediate practical importance to the sponsor (USAJFKSWCS).

RP97-12 Cumulative Special Forces Assessment & Selection Database User's Guide and Codebook, Alderks, C.E. March 1997. (AD B227 507)

This report describes the development and contents of the Cumulative Special Forces Assessment & Selection (SFAS) Database. The information in the database was obtained from the U.S. Army John F. Kennedy Special Warfare Center and School (USAJFKSWCS). Variables include basic demographics, Intelligence and Aptitude Scores, SFAS Outcome Scores, Prerequisite and Phase I Timed Events and Ratings, and Phase II Team Performance Events. This database is organized by individual, class, and fiscal year. This database is useful if the user's objective is to analyze data within or across classes and fiscal years. It also provides the capability for longitudinal research, and when combined with the Special Forces Qualification Course (SFQC) Database, can be used to track individuals over the Special Forces selection and training process. The database was developed to answer questions of immediate practical importance to the sponsor (USAJFKSWCS) and to support the U.S. Army Research Institute for the Behavioral and Social Sciences' long-term Special Forces research program.

RP97-13 Task Analyses of Two Combat Service Support Critical combat Functions as Accomplished by a Brigade, Huffman, J.A.; Finley, D.L. June 1997. (AD A328 907)

This research product presents task analyses of 2 of the 12 critical combat functions (CCFs) that compose the Combat Service Support (CSS) Battlefield Operating System (BOS). These are: CCF 28, Provide Transport Services; and CCF 29, Conduct Supply Operations. These analyses are required by the brigade to achieve the outcomes necessary to provide supplies and transportation for a heavy brigade in compliance with the commander's concept and intent. These analyses identify the critical tasks and

subtasks undertaken by the brigade commander, his staff, and the brigade's subordinate and supporting commanders and staffs. They reflect those activities performed during the planning, preparation, and execution phases of the battle. These analyses can be used by different functional specialists (e.g., training, combat and force developers). They will be especially of value where organizational interrelationships need to be considered in issues concerning combined arms integration, interaction, and synchronization. For example, the analyses provide information useful to training developers concerned with improving the proficiency with which transport and supply activities are coordinated and then integrated into combat mission planning, preparation, and execution.

RP97-14 Guide to Development of Structured Simulation-Based Training, Campbell, C.H.; Deter, D.E. June 1997. (AD A328 666)

The Army Research Institute for the Behavioral and Social Sciences (ARI) and the Force XXI Training Program have sponsored the development of a structured simulation-based training program for selected staffs of conventional mounted brigades. The development effort, entitled the *Combined Arms Operations at Brigade Level, Realistically Achieved Through Simulation* (and known as COBRAS) resulted in construction of training support packages (TSPs) for large-scale exercises and for small-group vignette. Development of the scenario and all TSP materials followed the guidance found in the *Methodology for Development of Structured Simulation-Based Training*, published by ARI in 1995. The *Report on the Methodology for Development of Structured Simulation-Based Training Programs* expands the guidance found in the original methodology, based on experience in the COBRAS program. This guide contains additional examples and warnings, and more in-depth coverage of TSP construction and formative evaluations. It is intended for use by training designers and developers, as well as training program reviewers and proponents.

RP97-15 Training Computer Skills for the Future Battlefield: A Review and Annotated Bibliography, Throne, M.H.; Lickteig, C.W. August 1997. (AD A337 314)

As the Army moves toward a digital battlefield, the nation's defense will become reliant on the computer skills of its leaders, soldiers, and civilians. To embody this future force, Army training must successfully address the acquisition, retention, and transfer of computer skills. As a first step toward this goal, this research product reviews the literature concerning the acquisition, retention, and transfer of computer-based skills. A review of 76 articles examining the training domains of programming, software, simulation, and gaming ability was performed. General conclusions for each training area (acquisition, retention, and transfer) are presented. In general, the research does not build on previous findings in the area. In addition, many areas, such as the long-term retention of computer skills and individual difference variables, remain to be explored.

RP97-16 A Description of Multimedia Presentation of COBRAS Vignette Training Support Package Information, Hoffman, R.G. September 1997. (AD A336 703)

The purpose of this paper is to describe a multimedia presentation of the background information needed to participate in a COBRAS vignette staff training exercise. Vignette exercises provide opportunities for brigade staffs to practice selected aspects of the planning and execution of heavy armored brigade missions. Because each exercise targets a different staff process, participants must become acquainted with the background scenario that provides the context for the activities they will practice. Training materials originally developed for the presentation of this background information were paper-based. To the detriment of the exercise, participants have had a tendency to avoid reading these materials. Multimedia may provide a more stimulating and efficient delivery method, but only if it is well designed. The outline of a multimedia presentation for one of the vignettes is developed using guidelines concerning the structure of the information being presented, sensory modalities suited to types of information, and principles of intrinsic motivation. The paper recommends testing the effectiveness of multimedia for delivering this type of training information.

Research Reports

RR1702 Standardizing Army After Action Review Systems, Miliza, L.L. October 1996.
(AD A322 044)

The After Action Review (AAR) is the Army's approach for providing feedback to units after collective training exercises. AAR systems should support the goals of analyzing what happened during an exercise, deciding why it happened, and identifying potential corrective actions. In an effort to reduce duplication of efforts, the Army is developing a Standardized Army AAR System (STAARS) for application across the live, virtual, and constructive environments. This report presents lessons learned about the AAR process, operational AAR systems, and prototype AAR systems that provide input for specifying STAARS capabilities or identify technical or behavioral issues to be addressed by research and development.

RR1703 An Expansion of the Virtual Training Program: History and Lessons Learned, Graves, C.R.; Myers, W.E. January 1997.
(AD A328 416)

This report describes the "Simulation-Based Multiechelon Training Program for Armor Units - Battalion Exercise Expansion (SIMUTA-B)" Project, a follow-on to the "Simulation-Based Multiechelon Training Program for Armor Units (SIMUTA)" Project. The purposes of the project were to: (a) implement and validate the structured simulation-based training development methodology derived during the SIMUTA Project, (b) expand the U.S. Army Armor Center's Virtual Training Program (VTP) exercise library, and (c) revise portions of the VTP's original training support package. The report first describes the VTP initiative and identifies the SIMUTA-B Project objectives. It then describes the project's design phase, formative evaluation effort, and development phase. The design phase section covers the processes of identifying training objectives and composing the mission scenario. The formative evaluation section identifies the evaluation strategy and methodology, and the product testing schedule. The development section provides high-

lights of development activities and accomplishments. The final section presents lessons learned for use in future development efforts.

RR1704 Small Team Portal Into the 21st Century—SP21, Salter, M.S.; Knerr, B.W.; Lampton, D.R.; Fober, G.W.; Dressel, J.D. December 1996. (AD A323 581)

Behavioral scientists from the U.S. Army Research Institute for the Behavioral and Social Sciences assisted the Institute for Defense Analyses (IDA) Simulation Center in conduct of excursions into the virtual 21st Century battlefield. The 1996 Defense Science Board (DSB) Summer Study requested analytical insights about concepts and technologies being considered for small team operations on the DSB's conceptual 21st Century Battlefield. The DSB focused on the concept of using technology to enable small, rapidly deployable forces to accomplish missions previously only available to larger forces. Exercises were conducted in a virtual simulation environment. U.S. Army and Marine Corps personnel used specially designed devices in a virtual simulation facility to test concepts about the capabilities of small (3- to 12-man) teams operating in a sensor-rich environment. In addition to computer reported data, behavioral and tactical observers documented man-in-the-loop soldier performance and interactions with specific equipment. Combat effectiveness was enhanced through sophisticated communication devices and computers. Personnel were able in the virtual environment to perform tasks similar to those that might occur in a future battlefield scenario. A benefit of the simulation was the ability to portray future missions with prototype equipment.

RR1705 Training for Operations Other Than War (Stability Operations): Front End Analysis, Salter, M.S. December 1996.
(AD A323 247)

This report is a research byproduct that documents the Front End Analysis for development of the Brigade-Battle Staff Training System (BDE-BSTS).

BDE-BSTS, a set of functional area training packages for brigade-level staff officers, is a combination of text and computer-based instruction (CBI). Sponsored by the Defense Advanced Research Projects Agency (DARPA), the BDE-BSTS was developed for use by the U.S. Army National Guard (ARNG). The prototype BSTS comprised 13 courses for training brigade staff officers in individual functional areas and those tasks required to prepare staffs for collective battle staff tasks. The BSTS program, sponsored under the DARPA program umbrella of Simulation in Training for Advanced Readiness (SIMITAR), is coordinated with three other programs: Simulation-Based Mounted Brigade Training Program (SIMBART), Simulation-Based Multiechelon Training for Armor Units (SIMUTA), and Combat Service Support (CSS) Training System Development for the National Guard.

RR1706 Canceled.

RR1707 Commanders' Survey: School for Command Preparation Feedback. Frame, A.A.; Lussier, J.W. January 1997. (AD A328 412)

The School for Command Preparation, Command and General Staff College, Fort Leavenworth, KS provides three sequential courses for battalion and brigade command selectees. All command designees attend the PreCommand Course (PCC). PCC provides common understanding of current doctrine, and up-to-date information on Army-wide policy, programs and special items of interest. In conjunction with PCC, spouses are invited to attend the Command Team Seminar (CTS). With commanders, they gain awareness of issues that impact families, the unit, and the community. The remaining two courses, the Tactical Commanders' Development Course (TCDC), and the Battle Commanders' Development Course (BCDC) emphasize warfighting skills and the art of battle command for tactical leaders. The Fort Leavenworth Research Unit developed a survey instrument to obtain commanders' assessment of courses following assignment to their commands. Commanders who had attended these courses in the previous 2 years were solicited for feedback. They gauged the usefulness of topics pre-

sented, and indicated their level of agreement with statements regarding the courses. They were asked what issues they felt were not addressed during the course and what they would share with incoming commanders. Responses (N=254) were compiled and analyzed. All courses received positive evaluations. Many commanders desired discussions with experienced commanders to cover OPTEMPO, resource constraints, and personnel management issues. Feedback provided useful suggestions and current trends.

RR1708 Developing an Automated Training Analysis and Feedback System for Tank Platoons. Brown, B.; Wilkinson, S.; Nordyke, J.; Riede, D.; Huyssoon, S.; Aguilar, D.; Wonsewitz, R. May 1997. (AD A328 445)

The Army has adopted the After Action Review (AAR) process as the means of providing feedback after collective training exercises, and the quality of AARs depends upon how well trainers can prepare and use data displays to show what happened during exercises and guide interactive discussions on how to improve unit performance. A previous report described a demonstration of the capability of the Automated Training Analysis and Feedback System (ATAFS) to automatically generate AAR aids after exercises in the networked simulator environment. This report describes the results of a follow-on effort to complete the development of the complete set of planned AAR capabilities and test the prototype ATAFS in a mix of Army National Guard training environments.

RR1709 Enhancing Performance in Light Infantry Digital Tactical Operations. Graham, S.E.; Valentine, P.J.; Washington, L.E. June 1997. (AD A328 676)

At the request of the Commanding General, U.S. Army Infantry Center, this report assesses whether current digitization efforts for the light forces are addressing the specific needs of light forces, as opposed to more simply migrating heavy/mechanized digital solutions to light platforms. Twelve Infantry leaders, selected by the Chief, Dismounted Battlespace Battle Lab, provided information: the most

critical digital concerns for light Infantry; differences between light and heavy tactical operations centers (TOCs); battle captain requirements; modifications of light Infantry tactics, techniques, and procedures (TTPs) resulting from digitization; and "soldier as a platform" requirements. The most frequently mentioned light Infantry TOC concern was the need for user-friendly, information management capabilities that will allow: situational awareness of friendly and enemy units, more accurate and simpler battle tracking, and integrated access to information across battlefield operating systems. Responses also indicate significant efforts must be made to minimize information overload. New training programs, TTPs, and automated tools must be developed to permit full utilization of new digital capabilities. The new digital systems must be lightweight, durable, and maintainable, and contain reliable communication links with adequate bandwidth. Relevant results from the Warrior Focus and Focused Dispatch Advanced Warfighting Experiments are also summarized.

RR1710 Report on the Expanded Methodology for Development of Structured Simulation-Based Training Programs, Campbell, C.H.; Deter, D.E.; Quinkert, K.A. June 1997. (AD A328 671)

The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) and the Force XXI Training Program have sponsored the development of a structured simulation-based training program for selected staffs of conventional mounted brigades. The development effort, entitled the *Combined Arms Operations at Brigade Level, Realistically Achieved Through Simulation* (and known as COBRAS) resulted in construction of training support packages (TSPs) for large-scale exercises and for small-group vignettes. Development of the scenario and all TSP materials followed the guidance found in the *Methodology for the Development of Structured Simulation-Based Training*, published by ARI in 1995. This report documents an expanded methodology, based on experience in the COBRAS program. The expansion is contained in the *Guide for Development of Structured Simulation-Based Training*. The Guide contains additional examples and warnings,

and more in-depth coverage of TSP construction and formative evaluations. This report discusses the activities in the methodology.

RR1711 Analysis of Command and Control Battlefield Functions as Performed in the Armored Brigade, Ford, J.P.; Mullen, W.J.; Deesling, J.W. June 1997. (AD A328 661)

The purpose of the research was to document the synchronization required by command and control tasks performed within the armored brigade, to include CS/CSS units. The immediate application of the documentation was to support developers of staff training in two related projects: Battle Staff Training System and Staff Group Trainer. The documentation was also intended to assist with the planning and execution of collective training. The documentation approach was to apply function analysis (FA) techniques for battlefield functions (BFs) in the Command and Control battlefield operating system. Thirteen FAs were developed for the Brigade headquarters and four supporting units: direct support field artillery battalion, engineer battalion, forward support battalion, and air defense artillery battery. The FAs were revised through a formative evaluation process that included internal review and successive external reviews by combat training centers, proponent agencies, and a review council representing potential users of the FAs. The final products include the FAs, a user's guide, and assessment packages for the BFs.

RR1712 Audio Teletraining for Unit Clerks: A Cost-Effectiveness Analysis, Wisher, R.A.; Priest, A.N.; Glover, E.C. June 1997. (AD A337 689)

A cost-effectiveness analysis of training Army National Guard soldiers by audio teletraining technology was conducted. The trainees were $n=225$ soldiers nationwide. About half of the trainees received training in a 3-week Unit Clerk Course through traditional residence training at the Professional Education Center in Little Rock, AR. The remainder received the same instruction by the same instructors through audio teletraining, a low-cost training technology. Objective performance data were col-

lected from written tests on 16 of the 47 tasks taught. Trainees in the audio teletraining group had a 93% Go rate (on first attempt), which was significantly higher (by statistical test) than the 85% Go rate for the residence group. In comparing costs, the audio teletraining group had lower training costs, on average \$1,135 per trainee. This was due primarily to an avoidance of travel costs for the audio teletraining group. Projected on an annual basis, the Army National Guard can save \$292,404 per year through the use of audio teletraining for the Unit Clerk Course.

RR1713 Tactical Communications Research and Development Requirements from Signal and Behavioral Science Perspectives, Finley, D.L. June 1997. (AD A337 680)

Requirements are described for research on the effects of signal realities on Army warfighters to minimize their frequency of occurrence and adverse impacts. "Signal realities" are defined as degradation of electronic communications and automation capabilities as can occur during tactical operations under actual dynamic battlefield conditions. This report analyzes the realities and consequences of battlefield communications degradation; Signal Branch roles in combat; warfighter tendencies to overlook signal realities during operations and exclude realistic communications problems from training; and behavioral science literature on this topic. Based on this information, research goals are specified to identify and clarify effects of degraded signal on battle processes and outcomes; how procedures might be modified to avoid, or adjusted to overcome, these effects; interdependent relationships between signal and warfighter tasks when conducting collective missions, and those tasks best accomplished jointly; and how to improve, through training, battlefield tactical operations supported by signal equipment capabilities. Research areas supporting these goals are then discussed. These include specifying the impacts of communications capability on battle processes and outcomes; identifying training requirements; answering related training research questions and concerns; exploring possible changes in soldier functions, du-

ties, and organization; and developing tools to aid digital battlefield performance.

RR1714 Preliminary Evaluation of the Computer-Based Tactics Certification Course—Principles of War Module, Pleban, R.J.; Brown, J.B.; Martin, M.T. July 1997. (AD A337 673)

This report describes a portion of the U.S. Army Research Institute for the Behavioral and Social Sciences Infantry Forces Research Unit's work in the formative evaluation of the computer-based Tactics Certification Course (TCC)—Principles of War Module. Sixteen subjects from the U.S. Army Infantry School were randomly assigned to one of two groups. The experimental group received the computer-based instructional version of the Principles of War module and an end-of-module quiz. Subjects assigned to the control condition received only the end-of-module quiz. In addition to the quiz, subjects completed a background/computer experience survey and a questionnaire assessing their opinions on selected aspects of the Principles of War module. Subjects in the experimental group answered significantly more quiz items correctly (88.9%) than did subjects in the control condition (48.1%). Ratings of selected aspects of the module varied. Certain sections of the module clearly needed to be modified. Other sections required only minor refinements. The overall ratings of the instructional value of the course were positive. The results from this research will be used to refine selected areas of the module.

RR1715 Battle Staff Training System in Support of Force XXI Training Program: Methodology and Lessons Learned, André, C.R.; Wampler, R.L.; Olney, G.W. September 1997. (AD A338 728)

This report documents the methodology and lessons learned in the development of the Innovative Tools for Brigade and Below Staff Training - Battle Staff Training System (ITTBBST-BSTS). The ITTBBST-BSTS consists of functional area training support packages (TSPs) for individual battalion and brigade level staff officers. The TSPs combine computer-based instruction (CBI) and text. Each TSP pre-

sents a course of instruction as CD-ROM based programs and supplemental text-based instruction with a training management system. Courses train commanders and staff officers in their individual combat skills to enhance their proficiency in synchronization of battlefield operating systems. The ITTBST-BSTS was developed for use by the Total Force, Active and Reserve, and designed for use in a local area network, wide area network, or stand-alone computer mode. An internal review and external evaluation process supported revision of each TSP. The final products included the TSPs, a User's Guide, and a System Administrator's Guide.

RR1716 Selected Training Practices for Military Operations in Urban Terrain (MOUT),

Sulzen, R.H. September 1997.
(AD A335 862)

The Army and Marine Corps both consider Military Operations in Urban Terrain (MOUT) to be a central part of future training and together have a joint MOUT Advanced Concept Technology Demonstration (ACTD) underway. Training facilities for mili-

tary and law enforcement agencies include firing ranges, mock towns or villages, and shoot houses. Makeshift facilities for dry-fire drills include engineer tape staked out on the ground and rooms in any building available. Training in Close Quarter Combat (CQC) is offered in Army and Marine Corps training courses. Training time was mostly allocated to live fire and live simulation. Team dry-fire drills were often extensively practiced before team live fire, but considered as a part of the safety training required as a part of live firing. Before team live-fire training, Army units usually conduct individual marksmanship training. In many cases, standards were set for individual qualification before soldiers could participate in team live fire. Live simulation was both with the multiple integrated laser engagement system (MILES) and Simunition. Law enforcement agencies (including Military Police) and Marines were more likely to use Simunition. Those using Simunition who also had experience with MILES preferred Simunition for live simulation training.

Special Reports

- S30 National Training Center Research Element, Fort Irwin, California, 1986-1996**, Sulzen, R.H. October 1996. (AD A326 056)

The U.S. Army Research Institute for the Behavioral and Social Sciences-National Training Center (ARI-NTC) Research Element mission was to provide research and development support to the NTC Observation Division and the NTC to improve feedback, assess performance, and achieve data related to NTC unit performance. For one decade ARI provided assistance at Fort Irwin, California, to achieve these goals. Ten Observer/Controller (O/C) Guidebooks were developed to assist new O/Cs in the performance of their training and control duties. The Determinants of Effective Unit Performance project was undertaken to determine the effects of home station training on performance at the NTC. Results indicated that units expending more resources during home station train-up performed better at the NTC. More successful units implemented the Army training management cycle more fully. A study focusing on the opposing forces (OPFOR) at NTC, long recognized as performing well because of their additional training time, identified four practices that could help units preparing for the NTC. Training development support was provided to the Army in Tactical Engagement Simulation. Analysis of a series of battles provided evidence for the benefit of repetitive practice of collective skills.

- S31 Making Decisions in Natural Environments**, Klein Associates Inc. February 1997. (AD A327 969)

This report surveys the field of naturalistic decision making (NDM) and shows its potential for support-

ing the needs of the U.S. Army. The report is written from the perspective of a researcher who has been active in developing models and methods in this new approach. The objective is to show the value of NDM for helping the Army address current challenges, including its use of information technologies, its need to downsize forces, and a change in its expected missions.

- S34 USAREUR Family Support During Operation Joint Endeavor: Summary Report**, Bell, D.B.; Bartone, J.; Bartone, P.T.; Schumm, W.R.; Gade, P.A. September 1997. (AD A339 016)

The purpose of this report is to summarize the major findings from a joint Walter Reed Army Institute for Research and U.S. Army Research Institute study of the ability of USAREUR families to adapt to the stresses of Operation Joint Endeavor (OJE) in Bosnia and Hungary. The research which was conducted between April and June 1996 had two parts: an intensive study of four USAREUR communities and a USAREUR-wide spouse survey. The findings and recommendations to USAREUR leaders and staff covered seven issues: (1) spouse support for the mission, (2) the effect of OJE on families, (3) types of families which were a challenge for the service providers, (4) R&R programs, (5) spouse-soldier communications, (6) Family Assistance Center Operations, and (7) spouse ratings of family service agencies. The findings suggest that overall, USAREUR did an excellent job of supporting its families. That is, although the deployment was unpopular and the stress levels were high, the spouses felt that the Army was doing what it could to support them.

Study Notes

SN97-01 Virtual Environmental Interface Requirements for Combat Leader Training and Rehearsal, Sticha, P.J.; Campbell, R.C.; Schwalm, S.R. August 1997. (AD A335 858)

The Army has made a substantial commitment to the use of networked computer simulations for training, concept development, and test and evaluation. The current networked training system — Simulation Networking (SIMNET) — and the next generation system — the Close Combat Tactical Trainer (CCTT) — provide effective forms of training for soldiers fighting from vehicles, but these systems are unable to do the same for individual dismounted soldiers. Virtual Environment (VE) technology has

the potential to provide Individual Combat Simulations (ICS) for the electronic battlefield. This report reviews the current state-of-the-art and projected future capabilities of the VE technologies associated with speech recognition, gesture recognition, and computer-generated forces. The review provides a roadmap that outlines the potential applications of these VE technologies for training, mission rehearsal, and performance measurement for combat team leaders; enumerates the technological capabilities need to implement these applications; specifies realistic near-term goals for prototype development and testing; and identifies knowledge gaps and the research needed to fill them.

Study Reports

SR97-01 The 1995 Gender Integration of Basic Combat Training Study, Nottorn, J.A.; Foster, D.A.; Brady, E.J.; Marshall-Mies, J. February 1997. (AD A322 335)

This report summarizes a series of studies from 1993 through 1995 of the attitudes of soldiers-in-training and their training cadre during squad-level, gender-integrated Basic Combat Training (BCT) for soldiers in Combat Support and Combat Service Support military occupational specialties. During each of the three phases, soldiers completed a pre-training and post-training questionnaire, and the training cadre completed a post-training questionnaire. A total of 3,963 soldiers and 277 training cadre were surveyed. Focus groups were conducted with all-male and/or all-female groups from each of the participating companies and with male and female training drill sergeants. Training performance and soldierization in a gender-integrated environment were more positive for female soldiers and as positive as single-gender training for male soldiers. Preparation of drill sergeants—especially training to work with and train female soldiers—is key to the success of gender-integrated BCT. Chain of command support is necessary for continued success of gender-integrated training.

SR97-02 NTC-CD Systems: Recreating the NTC Experience, Lussier, J.W.; Michel, R.; Frame, A. February 1997. (AD A328 363)

Past research exercises at the Fort Leavenworth Research Unit have measured battle command skills of visualization and forecasting. A highly favorable response to these exercises coupled with CD-ROM capability to vividly present combat training center battles led to the current initiative: develop multimedia prototype instructional modules aimed at facilitating battle command competencies of visualization, information assimilation, forecasting, analysis, and battle-decision making. This initiative utilizes information from observations and interviews at the Command and General Staff College's School for Command Preparation and of battle com-

manders and observer/controllers during National Training Center (NTC) rotations. Users are presented with NTC battles and prompted to make predictions, critiques, and other responses. The report structures synthesis of multimedia capability with battle command research to provide a CD-ROM tool that supports the developing educational needs of battle commanders.

SR97-03 Canceled.

SR97-04 Gender Differences in Job Satisfaction in the U.S. Army, Jones, J.T. August 1997. (AD A339 232)

This report summarizes findings from the *Spring 1995 Sample Survey of Military Personnel (SSMP)* which focused on soldier satisfaction with aspects of their Army life, jobs, and careers. A total of 15,113 soldiers responded to the survey. There were few, if any, differences between males and females in their responses to items on Stress, Promotion Potential, and Global Satisfaction (job/career/life). Females were more positive in their responses to items covering Benefits, Family, Equity, Basic Pay, Job Security (officers only), and Job Characteristics (enlisted only). Males were more positive in their responses to items covering Co-Workers, Supervisors, Leadership, Developmental Courses (more likely to have had courses), and Absence from Duty Station for Military Reasons (more likely to be deployed/TDY/in training). Results from the survey did not identify any clear-cut relationships between job satisfaction and career intent for males or females; however, it does appear that separation from family may be an important factor in why some female soldiers decide to leave the Army.

SR97-05 Adverse Impact Implications of Selection Instrument Group Score Differences, Silva, J.M. March 1997. (AD A338 809)

Human resources decision-makers are concerned when mean inter-group score differences on selection measures are observed. Moreover, they are not

concerned with the magnitude of the differences *per se*, but rather with whether those score differences will manifest themselves as adverse impact. An analytical approach was used to estimate for various combinations of selection ratio and minority applicant group representation, the maximum group score difference that would not violate the "four-fifths" rule. In addition, applicant pools of specific sizes with no mean inter-group score difference on the selection measure were considered to compute the conservative likelihood of encountering an adverse impact situation in a specific applicant sample. The results clearly suggest that the identification of adverse impact and its statistical substantiation will often occur in small applicant pools (i.e., 100), even when there is a small inter-group difference on the selection measure. For larger samples (i.e., 500), the results suggest that adverse impact will often be indicated when small mean inter-group selection measure differences are present. It is not clear to what degree the adverse impact found would be statistically substantiated. Research focusing on adverse impact and its statistical substantiation is needed for specific inter-group difference/applicant pool size combinations to create a clearer equivalence between inter-group differences and adverse impact.

SR97-06 The Optimal Job-Person Match Case for Attrition Reduction, Greenston, P.M.; Nelson, A.; Gee, D. September 1997. (AD A338 823)

The purpose of this research is to illuminate an important interaction between personal characteristics and organizational factors as they affect first-term attrition. This study tests the hypothesis that first-term completion is positively related to predicted performance on the job and estimates the attrition reduction that would accompany the utilization of better methods for assigning recruits to jobs so as to improve their predicted performance. The testing is conducted with the 1991 accession cohort using the U.S. Army Research Institute for the Behavioral and Social Sciences' Enlisted Panel Research Data Base (EPRDB). Regression analysis is used to test for a relationship between attrition behavior and predicted performance on the job, holding other factors constant. This relationship is then applied to estimate the attrition reduction that could be brought about by increased soldier performance through improved job-person matching procedures such as the Enlisted Personnel Allocation System (EPAS).

Technical Reports

TR1049 Effects of Display Type on Performance in Virtual Environments, Lampton, D.R.; Gildea, J.P.; McDonald, D.P.; Kolasinski, E.M. October 1996. (AD A322 046)

This research was conducted as part of a program to determine interface requirements for enabling dismounted soldiers to train in Virtual Environments (VEs). We compared different VE display devices in terms of their effects on task performance, skill acquisition, and side effects. Forty-eight college students completed a series of visual and psychomotor tasks, a subset of the Virtual Environment Performance Assessment Battery (VEPAB), using either a Head-mounted Display (HMD), a head-tracked boom-mounted display, or a standard computer monitor. Performance on vision tasks was sensitive to differences in display devices and to individual differences. Visual acuity scores were ordered according to estimates of the resolution of the displays, but were worse than what would be predicted from the resolution estimates. In comparison to real-world performance, distance and height estimation in the VEs varied greatly across participants, especially with the HMD. Motor tasks had high reliability, demonstrated small but significant practice effects, and were correlated with participants' use of computers and video games. Unexpectedly, even the standard monitor group showed a significant increase in simulator sickness scores. The VEPAB tasks should prove useful in the future when design tradeoffs must be made in the process of developing training system prototypes.

TR1050 Training Critical Thinking Skills for Battlefield Situation Assessment: An Experimental Test, Cohen, M.S.; Freeman, J.T.; Fallesen, J.J.; Marvin, F.F.; Bresnick, T.A. October 1996. (AD A320 892)

In battlefield situation assessment, officers must interpret information that is incomplete, unreliable, and often conflicting and gather new information to improve their assessments and plans. In previous work, a framework for these cognitive activities was

developed based on interviews with activity-duty command staff, and a training method was developed. That training helped officers to find and assess the reliability of hidden assumptions and to resolve conflicting evidence. Forty-three U.S. Army officers participated in an experimental training study with scenario-based tests. Trained officers generated more accurate arguments concerning a given assessment than did controls. Improvements in quality were related to the increased relevance of their judgments. In some problems, training countered a tendency to change hypotheses too readily; in other problems, training countered a tendency to hold on to a hypothesis too long. Training did not decrease confidence in evaluations, nor did it hypersensitize officers to information.

TR1051 Canceled.

TR1052 Canceled.

TR1053 ASVAB Correlations Are Lower for Higher Aptitude Groups, Legree, P.J.; Pifer, M.E.; Grafton, F.C. January 1997. (AD A328 529)

Previous research demonstrates that correlations among IQ tests are lower when estimated using higher scoring individuals (Detterman & Daniel, 1989; Lynn, 1990). However, this phenomenon has only been documented using individually administered measures of intelligence, and attempts to extend the demonstration to other specialized aptitudes have failed (Detterman, 1993). The present study divides the 1980 Armed Services Vocational Aptitude Battery (ASVAB) weighted norming sample into five aptitude levels with similar levels of variance. Analyses show that the ASVAB tests are less correlated within higher aptitude groups provided that the scales used to define the groups are psychometrically sound: for three highly skewed ASVAB tests, a ceiling effect prevents this phenomenon; for the remaining seven tests the phenomenon replicates; and the magnitude of the effect is proportional to the skewness of the scale, $r = .85$. These findings sup-

port the assertion that cognitive aptitudes are less correlated in higher aptitude groups, imply that greater classification effects can be associated with higher scoring groups, and qualify the use of the multivariate correction for restriction of range.

TR1054 Economic Life Course Analysis of Peacekeeping Deployment in the Sinai, Lakhani, H.; Tartk-Abod, E.
January 1997. (AD A323 250)

This report has two objectives. The first objective is to estimate the extent of financial gains or losses of Active Component (AC) and Reserve Component (RC) soldiers for the Multinational Force and Observers (MFO) peacekeeping mission in the Sinai. The second objective is to estimate the effect of these gains/losses on soldiers' intentions to remain in their respective component until retirement. Data for a population of approximately 500 soldiers were collected during their predeployment training at Fort Bragg, NC and during deployment at the South Camp in the Sinai. Results of these analyses revealed that AC soldiers perceived a small financial loss (\$102 per month) and RC soldiers perceived considerable financial gain (\$335 per month). Therefore, soldiers experienced net average financial gains (\$233 per month). Regression results for change in financial status revealed that civilian earnings were negatively related to financial gains of the RC. Regression results for career commitment revealed that the soldiers' likelihood of staying in their respective component until retirement increased with financial gains, while statistically controlling for satisfaction with Army life and demographic variables.

TR1055 An Additional Metric for Communicating Group Performance Differences, Silva, J.M. February 1997. (AD A328 532)

The common practice of expressing group performance differences in standard deviation units conveys useful but limited information. Reporting the percentage of the time a member from a lower-performing group is expected to outperform a member from a higher performing group would enhance understanding of the magnitude of the difference. Furthermore, the proposed percentage metric is able to

easily deal with group variability differences in addition to mean group differences. An analytical approach was used to convert group performance differences from standard deviation units to the proposed metric. The slope of the relationship between the two metrics is nearly linear through a one standard deviation group performance difference. Tables are presented that can be used to convert group performance differences in standard deviation units to the new metric.

TR1056 Terrain Appreciation in Virtual Environments: Spatial Knowledge Acquisition, Singer, M.J.; Allen, R.C.; McDonald, D.P.; Gildea, J.P. February 1997. (AD A325 520)

The U.S. Army Research Institute for the Behavioral and Social Sciences is investigating the requirements for using Virtual Environments (VE) in training dismounted soldiers. This experiment investigated the effects of different VE parameters on spatial knowledge acquisition by comparing learning in advanced VE, restricted VE, and standard map training. This report also provides information about VE displays, head-coupling, presence, and simulator sickness associated with spatial knowledge acquisition in VE. The activities used during the learning phase of the experiment are generic to dismounted soldier activities. The high-level virtual environment (Hi-VE) condition had a Stereoscopic Head-Mounted Display (HMD) with fully head-coupled gaze control and treadmill-based movement control. The restricted VE configuration (Lo-VE) used the same HMD with both gaze direction and viewpoint movement controlled by a joystick. The map training participants used expanded topographical maps and were subsequently tested in the Hi-VE configuration. Participants were all trained on the definitions and representational configuration of a reduced set of topographical features and dismissed if unable to reach a minimum criterion. The Simulator Sickness Questionnaires (SSQ) and the Immersive Tendencies Questionnaire (ITQ) were administered before the VE experience. Participants received training in VE movement and control before the experiment.

TR1057 Learning in a Synthetic Environment: The Effect of Visual Display, Presence, and Simulator Sickness, Johnson, D.M.
February 1997. (AD A328 285)

Soldiers explored a synthetic representation of an Army heliport under three visual display conditions: (1) wide field of view (FOV) helmet-mounted display, (2) narrow FOV helmet-mounted display, and (3) stationary, wide-screen display. Pretest and post-test measures of spatial knowledge were recorded. Measures of presence in the virtual environment were recorded. Measures of simulator sickness were administered upon exit from the virtual environment and 24 hours later. Overall, soldiers acquired a significant amount of spatial knowledge from the synthetic representation. When transferred to the actual Army heliport, soldiers were able to navigate around the location with near-zero errors. There was no effect of visual display on any measures of spatial knowledge. Also, there was no effect of visual display on reported presence or simulator sickness. Simulator sickness was significantly reduced after 24 hours away from the virtual environment. Presence did not correlate with spatial knowledge. Simulator sickness correlated negatively with spatial knowledge. Presence and simulator sickness were negatively correlated.

TR1058 Estimating AFQT by Telephone Using a Computer Adaptive Test, Legree, P.J.; Fischl, M.A.; Gade, P.A. March 1997.
(AD A328 971)

A computer adaptive test was administered over the telephone by reading items and response alternatives to 144 individuals who had recently enlisted in the U.S. Army and had completed the Armed Services Vocational Aptitude Battery (ASVAB). Subject responses were entered into a computer by the telephone interviewer, thereby allowing the adaptive test program to estimate aptitude with approximately 10 verbal items. Analyses indicate that the Telephone Test is highly correlated with the Armed Forces Qualification Test (AFQT) in the sample we tested, $r = .66$; the bivariate correction for range restriction estimated this population correlation to be .81. A confirmatory factor analysis produced a four factor solution with the Telephone Test loading at a

very high level (.91) on a Verbal factor, which had a substantial loading (.72) on a higher order factor. The magnitude of the factor loadings and the administration time (5 to 10 minutes) indicate that the procedure provides an excellent measure of crystallized Verbal aptitude that can be incorporated into brief telephone interviews and used to estimate AFQT and general aptitude.

TR1059 Using Psychomotor Ability for Selecting TOW Gunners, Silva, J.M. March 1997.
(AD A328 697)

The research examined the incremental validity of a psychomotor tracking test when added to traditional Army measures of cognitive ability. In addition, the actual gunnery performance of 911 TOW Gunners assigned with current procedures from a pool of 10,852 Infantrymen was compared to the predicted performance of 911 TOW Gunners hypothetically assigned on the basis of general cognitive ability (g) and tracking ability. Increments in validity resulting from the use of the tracking test were found, although the magnitude of the increases were smaller than expected. However, the increments resulting from hypothetical assignment using the tracking test were substantial. Whether TOW Gunner performance prediction was based on g , tracking score, or both, top-down hypothetical assignment of Infantrymen as TOW Gunners resulted in a significant improvement in predicted TOW Gunner gunnery performance and successful completion of training. If assignment as a TOW Gunner was based on tracking ability and was made from the full applicant pool rather than from those first assigned as Infantrymen, it is likely that TOW Gunner performance could be improved with no loss in performance in other military occupations. This is true even if gunnery performance in other Infantry occupations also depends on tracking ability. Implications for classification and job clustering are discussed.

TR1060 Canceled.

- TR1061 Assessment of User Reactions to the Multi-Service Distributed Training Testbed (MDT2) System**, Mirabella, A.; Sticha, P.; Morrison, J. April 1997. (AD A328 473)

This research was part of a larger program to develop a methodology for multi-Service training of Close Air Support (CAS), using Distributed Interactive Simulation (DIS) technology. This paper summarizes an assessment of user reactions to the training. Survey questionnaires, group interviews, and observations of the training were used to obtain data on two questions. What value is added to existing Service training cycles by the DIS methodology developed? How well did the training work? A key finding was that the distributed methodology fills a critical gap in training multi-Service CAS coordination tasks. An important potential application of the research is to "ramp-up" training in preparation for rotations to combat training centers. Many lessons were learned about how to develop and apply survey and interview instruments as part of a larger evaluation of DIS training. For example, we "discovered" that for multiple sites and services "one size does not fit all." Assessment instruments must be carefully prepared in different versions to suit the varying perspectives and roles of multiple services.

- TR1062 Analysis of Battlefield Operating system (BOS) Statements for Developing Performance Measurement**, Mirabella, A. April 1997. (AD A328 076)

This study was an initial effort in a larger program to develop training feedback measures and decision support methodology (DSM) for selecting brigade training strategies. Essential to either purpose is a set of reliable and valid unit performance measures. Such measures have traditionally been derived from front-end analysis. But archival data from the National Training Center (NTC) make possible a new, complementary approach of deriving measures from exercise data. In this study Battlefield Operating System (BOS) Impact Statements were used to derive unit performance measurement concepts. It was found that Impact Statements can be used reliably to judge relative unit performance across exercises, can be related to mission outcome, and can be used as a

basis for deriving improved measures for training feedback and training effectiveness.

- TR1063 Estimating Personality Constructs from Archival Data**, Evans, K.L. April 1997. (AD A328 816)

As part of a leadership research program at the U.S. Military Academy involving cadets in the Class of 1998, this report examined the viability of using archival data on prior cadets to estimate a variety of personality constructs among current cadets. Two sets of archival personality data on prior cadet classes were obtained. The first involved a short form administration of the ABLE inventory to cadets in the Class of 1994. The second involved the administration of the NEO Personality Inventory to the Class of 1996. Scores on the 12 scales contained in these inventories were used as archival criteria. Archival predictors were then sought from other survey and questionnaire items administered to cadets at the same point in time as the original inventories. For each scale, a different 20-item pool of predictors was developed from the archival items having the strongest zero-order correlations with that scale. A series of multiple regression analyses was then used to predict scores on each scale. An average R^2 of .39 per scale was obtained after cross-validation. Both the original scales and their analogs tended to manifest similar relationships with two external criteria examined, leadership performance and attrition.

- TR1064 Simulation-Based Communications Realism and Platoon Training in the Close Combat Tactical Trainer (CCTT)**, Finley, D.L. June 1997. (AD A337 692)

Training needs have long existed for skills in tactically dealing with variations in communications capability that occur on dynamic battlefields. These communications realism training needs are becoming more critical with the many advances in electronic communications technology. The new Close Combat Tactical Trainer (CCTT) will be the first training environment developed to simulate variations in electronics communications quality as would occur realistically. The CCTT was used to examine tactical communications training needs and simulation-based training strategies for Armor and

Mechanized Infantry platoons. Communications realism simulation capabilities of an initial version of the CCTT were then evaluated in light of these training needs and strategies. Overall communications realism training requirements for warfighters were found to constitute a general model that effectively served as an instrument to define platoon training requirements. Structured training was identified as the most appropriate training. It is recommended that these stages be designed into vignettes or tables integrated into exercises developed to meet platoon training goals related to maneuver and engagement. Possible enhancements to CCTT's simulation of communications realism were also identified and their potential payoffs discussed.

TR1065 Does Thinking About the Values of One's Peers Make These Values Seem More Important?, Savell, J.M. May 1997
(AD A329 110)

This experiment investigated the effect of peer-reference-group salience on the judged importance of specified values using a sample of 143 male and female African-American high school seniors. In half the cases, students first judged the importance of these values to themselves and then judged the importance of these values to their friends. In the rest of the cases, students first judged the importance of the values to their friends and then judged the importance of the values to themselves. Students who gave their own judgments in second position (and thus had a chance to think about these friends and their values before indicating their own judgments) gave own judgments that were closer to the judgments they attributed to their friends than did those who gave their own judgments first ($p \leq 001$). Students attributed to their friends a level of interest in joining the military that was similar to their own, but the peer-salience variable seemed not to have an effect. An unpredicted finding was that neighborhood socioeconomic status was negatively correlated ($r = -.43$, $p < 001$) with the absolute difference between own and attributed likelihood of joining the military, although it was uncorrelated absolute difference between own and attributed likelihood of joining the military, although it was uncorrelated ($p > .05$) (a) with the subject's own likelihood of

joining, (b) with the likelihood they attributed to their friends, and (c) with the arithmetic difference between these two values.

TR1066 Discerning Critical Information: A Prairie Warrior '96 Case Study, Simpson, D.; Fallesen, J.J. May 1997.
(AD A337 669)

The increased attention to technologies for battle command has brought about an increased awareness of the importance of abilities and traits for leadership and tactical decision making. This study examined the relationship between conceptual capacity and the ability to discern critical information. Conceptual capacity was measured with a cognitive complexity method that used self-report and clinical judgment. Critical information discernment (CID) was measured by instructors and trained observers during a Command and General Staff Officer College exercise (Prairie Warrior '96). Self and peer ratings were also collected on leadership skills, personality and attitudes, CID performance, and experience. No relationship was found between the primary measure of the current level of conceptual capacity and CID; however, a Biodata cognitive complexity measure was negatively correlated to CID. About one-half of the variance in CID performance was explained by seven variables. Variables that contributed positively were analytic style, rank of position in the exercise, and whether performance was expected to apply to their next assignment. Negatively weighted factors were openness, object orientation, staying alert for unusual information, and feeling time pressured.

TR1067 A Prototype Procedure for Optimizing Training Strategies, Matto, E.J.; Moses, F.L. June 1997. (AD A328 664)

For military units to be combat ready, they must be proficient in a collective set of tasks trained at various events. This report presents a research tool called the Training Strategies Optimization Prototype (TSOP) that shows potential to aid commanders in making decisions about how to improve strategies and schedules of training. TSOP was developed to determine whether available Army training data are adequate for systematically deriving

alternative training strategies to meet commanders' needs. The prototype uses Army battalion-level units, but is adaptable to scheduling problems at other echelons within the Army, for other services, and even for joint applications. This report illustrates TSOP's ability to provide the decision maker with an analytical means by which to schedule training events while considering both performance requirements and resource constraints. In many cases, the maximum level of troop proficiency may be attained through more than one combination of training events. TSOP is designed to allow the decision maker to identify the training strategy to attain and sustain troop proficiency within available resources.

TR1068 Examining the Feasibility of Developing Measures of Stress Adaptability,

Pulakos, E.D.; Arad, S.; Plamondon, K.; Kiechel, K.L. July 1997. (AD B233 957)

The goal of this effort was to examine and specifically define the construct of work-relevant adaptability and to explore the feasibility of developing innovative, computer-administered predictors of adaptability. To define work-relevant adaptability, project staff content analyzed thousands of critical incidents to develop and define adaptability dimensions. Eight adaptability dimensions were defined. A literature review was also conducted, focusing on literature relevant to individual difference constructs, as well as social, psychological, cognitive, and other literature to identify the constructs that may be important determinants of the ability to adapt. Next, we had a panel of experts rate the extent to which each predictor construct would be relevant for predicting performance in the different adaptability dimensions. The results of the expert judgment task suggest two primary implications. First, the different predictor constructs seem to be more or less relevant for forecasting adaptability in each of the eight adaptability dimensions. Second, measures should be designed that facilitate the identification of the type(s) of adaptability required for a given job, so that appropriate predictors can be selected based on the types of adaptability required on the job.

TR1069 Team Situational Awareness Training in Virtual Environments: Potential Capabilities and Research Issues,

Ehrlich, J.A.; Knerr, B.W.; Lampton, D.R.; McDonald, D.P. July 1997. (AD A337 606)

Members of small dismounted units face growing responsibilities and challenges in both combined arms combat and in contingency operations. Field training for these diverse missions is limited by cost and environmental factors. Virtual environment (VE) technology offers a potential complement to other training methods to meet the rapidly changing requirements for military training. This report provides an assessment, based on a review of the relevant research literature, of the capability of VE technologies, and strategies for their use, for training members of small dismounted units to acquire and maintain situational awareness. It summarizes the state of the art of research in the areas of situational awareness, team training, VE technology, and instructional strategies for simulation-based training. It identifies current and future challenges for providing situational awareness training to members of small dismounted units and makes recommendations for future research.

TR1070 Scoring System Improvements to Three Leadership Predictors,

Dela Rosa, M.R.; Knapp, D.J.; Katz, B.D.; Payne, S.C. November 1997. (AD A339 243)

This project sought to examine and improve the reliability of the scoring systems for three instruments which have been used in previous Army leadership research. Review of existing literature and interviews with project staff participating in prior research provided initial information concerning the strengths and weaknesses of the scoring systems for the three instruments. This information was used to recommend modifications to the original scoring systems. Six individuals were trained to use the modified scoring systems. The modified scoring systems were evaluated by rescoring responses randomly selected from the sample which had been scored according to the scoring systems originally developed for the leadership research program. Reliability estimates for the three modified scoring systems were

consistently strong and showed improvements over those obtained through the original scoring systems. Interrater agreement indices were significant for nearly all ratings. Validity estimates provided evidence that each modified instrument was moderately to highly correlated with conceptually similar scores generated through the original scoring scheme. The report recommends use of the revised rating systems in future research to improve the quality of measurement from the three predictors.

TR1071 The Substitutability of Criteria in the Development and Evaluation of ASVAB Classification Procedures, Zeidner, J.; Johnson, C.; Vladimirovsky, Y. September 1997. (AD A340 883)

The major goal of this research is to determine the adequacy of using operational skill qualification test (SQT) measures to serve as a criterion surrogate for the more widely accepted, but prohibitively costly, hands-on measures. If it could be shown that similar decisions are made or similar outcomes are obtained in the classification context, the criteria would be considered as substitutable for one another. Project A's longitudinal data set was used to obtain hands-on and job knowledge measures for 9 Military Occupational Specialties (MOS) and only job knowledge measures for an additional 6 MOS, 18 to 24 months after the cohort sample entered the Army. Operational Armed Services Vocational Aptitude Battery (ASVAB) and SQT scores for the same cohorts were available from official records. Findings indicate close similarities in: selecting tests for assignment composites, patterns of predictor test validities; classification efficiency (MPP); and in factor structure

in the joint predictor-criterion space. The overall conclusion is that either criteria can serve as a surrogate for the other in developing classification procedures using ASVAB.

TR1072 An Examination of Training Issues Associated with the Virtual Training Program, Shlechter, T.M.; Shadrack, S.B.; Bessemer, D.W.; Anthony, J. September 1997. (AD A338 732)

The present research effort was designed to examine the effects of units' home-station preparation upon their Virtual Training Program (VTP) activities. Also examined were the effects of the VTP upon units and unit leaders who had previously been through this training program. This investigation involved having unit leaders from platoons complete questionnaires on their preparation and sense of confidence in their own and their unit's tactical proficiency. Also, the VTP instructors completed questionnaire items on the participants' performance and level of preparation. Findings from both assessments provided further evidence for the VTP's instructional value. The participants' questionnaire responses indicated that the VTP had a significant, though modest, impact upon VTP-experienced unit leaders' sense of confidence in their own and their unit's tactical proficiency. The instructors' data suggested that the VTP had a salient effect upon the tactical skill proficiency of the sampled unit leaders. Their data also showed that home-station preparation did have an impact upon the training participants' VTP performance, and that many units were unprepared for their VTP rotation.

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Abbreviations

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 RR Research Report
 S Special Report

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 SR Study Report
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